

CHINA, INSIDE AND OUT

A Collection of Essays on
Foreign and Domestic Policy in the
Xi Jinping Era



China today is guided by a few overriding philosophies.

Outwardly, it is promoting a “new type of great power relations” between itself and the United States, and a “community of shared interests” within Asia. Inwardly, it is guided by the “Chinese Dream,” a vision for increased prosperity, greater social stability, and a higher quality of life for China’s people.

This collection of essays explore some of the realities of these philosophies—how they are reflected in Chinese policy, how they affect China’s relations with the United States and U.S. allies in the region, and how policy is responding to and also changing the ways Chinese citizens work and live.

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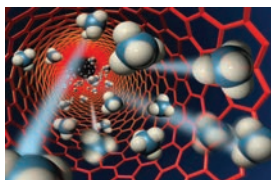
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Chinese graduates crowd stalls at a job fair in Bozhou city, east China's Anhui province, June 7, 2015.

The Chinese Dream: Strategic and Policy Priorities of the People's Republic

TIMOTHY R. HEATH AND BONNY LIN

“By the time the People's Republic celebrates its 100th anniversary, we will become a prosperous, strong, democratic, civilized, and harmonious socialist modernized country on its way to the ultimate great rejuvenation of the Chinese nation. This is the greatest dream of the Chinese nation in modern history.” — Xi Jinping, January 16, 2013

The challenge of governing the world's most populous nation and its second largest economy rests in the hands of the Chinese Communist Party (CCP)—an organization that, despite its anachronistic name, has reinvigorated its ideology and governing methods in recent years. The CCP has called fulfilling the “fundamental interests” of the people its primary aim. It intends to do this through policies that raise the standard of living and ensure the country's rise to greatness. Beijing is developing primary domestic and foreign policy objectives aimed at realizing this vision while facing numerous challenges to doing so.

Pursuit of the Chinese Dream

Reflecting a history of long-term, extensive planning, the CCP has outlined an ambitious vision to be achieved by mid-century. Called the Chinese Dream by Xi, this vision essentially repackages in a more contemporary form the long-standing CCP goal of the “rejuvenation of the Chinese people” (*zhonghua minzu fuxing*).

In effect, the Chinese Dream is a collection of policy objectives intended to increase prosperity, promote social stability, ensure a higher quality of life for citizens, and advance China's standing as a world power. In Xi's words, the Chinese Dream is the goal of building a “prosperous, strong, democratic, civilized, and harmonious socialist modernized country” to “definitely be realized” by the People's Republic of China's



The National Library of China in Beijing. With a collection of over 31.1 million items, it is the largest library in Asia and one of the largest in the world.

centennial in 2049. To ensure the country remains on course, the government has dozens of benchmarks to be achieved by 2021.

While primarily focused on the nation's rise, the Chinese Dream extends beyond collective ideals. PRC officials state that the Chinese Dream must ensure the "happiness of individuals." This shift reflects the reality that China's future economic growth will increasingly depend on the spending power of its consumers. The following domestic and foreign policies reflect how authorities hope to advance this vision.

Domestic Policy: Fulfilling Fundamental Needs

Since 2002, the CCP has designated itself a "governing party" oriented toward fulfilling the people's "fundamental interests"—a major evolution from the Deng Xiaoping era's near exclusive focus on rapidly increasing economic production. The CCP's strategic objectives and policies aim to meet the people's interests in five areas: economic, political, social, cultural, and environmental.

Economic

The CCP leadership has incrementally added new policy objectives to address economic issues that affect quality of life. The earliest objectives from 2002 focused on raising incomes. Since 2003, however, the party has expanded its economic objectives to emphasize balanced, sustainable growth. Beijing has moved to facilitate growth in the western and southwestern regions, increase urbanization, and raise incomes in rural areas, which are home to nearly half China's population.

Political

PRC leaders maintain that the party's rule is the only acceptable form of government. However, they acknowledge the need to accommodate citizens' demands for more influence in policymaking and for a fairer, more responsive judicial system. Corruption, incompetence, and malfeasance in both government and the judiciary have driven public dissatisfaction to dangerous levels, spurring leaders to increase investment in domestic security to a level exceeding even that of the military. The Fourth Plenum—a four-day meeting of the CCP's powerful Central Committee—in 2014 outlined numerous judicial reforms, though they have not yet been implemented.

Social

Growing public dissatisfaction with the high costs of rapid economic growth drove the party to address the people's diverse social welfare needs. In the mid-2000s, the party developed more policies aimed at improving education and health care, and reducing poverty and income inequality, although implementation remains inconsistent.

Cultural

PRC leaders have developed policies to cultivate Chinese culture domestically and expand its appeal internationally. It has also promoted political and moral values favored by the CCP.

Environmental

At the 18th Party Congress, leadership adopted policy objectives directed at cleaning up the country's heavily contaminated water, air, and soil. Authorities have also outlined policies to improve the quality and safety of food and other products. As with many other policy objectives, authorities continue to grapple with implementation.

Foreign Policy: Shaping the Regional and Global Order

As China has ascended into the upper echelons of global power, Beijing is discovering that its developmental and security needs are in some ways at odds with the current international order. It is also finding its developmental and security interests expanding around the world. As a result, China has articulated numerous goals for shaping the global and regional orders, and for defending its core interests.

International order

Chinese leaders since 2005 have promoted a vision of a "Harmonious World" to guide foreign policy toward shaping a world order amenable to China's rise. This idea, which features prominently in the Chinese Dream, upholds the authority of the United Nations and the basic structure of the existing economic and political order, but introduces new institutions and organizations as well as reforms to existing ones to better serve the needs of rising powers. Beijing also promotes political principles, such as the "Five Principles of Peaceful Coexistence," as basic norms for international laws and rules. PRC policy objectives support developing multilateral organizations to address disputes in a consultative manner. For the United States, Beijing seeks to establish a relationship defined by greater equality, cooperation on shared concerns, and U.S. accommodation of PRC core interests.

Regional cooperation

Under Xi, relations with the Asia-Pacific region have increasingly become a strategic foreign policy priority. China's policymakers have called for a "community of common

destiny" (*mingyun gongtong ti*), which envisions a high degree of economic integration to realize potential growth. Policies that reflect this imperative include the Silk Road, Economic Belt, and 21st Century Maritime Silk Road ("one belt, one road"), Asian Infrastructure Investment Bank (AIIB), and proposed regional free trade agreements.

Corruption, incompetence, and malfeasance in both government and the judiciary had driven public dissatisfaction to dangerous levels, spurring leaders to increase investment in domestic security to a level exceeding even that of the military.

This vision also carries security and political connotations. According to Vice Foreign Minister Liu Zhenmin, the community of shared destiny gives Asian countries "primary responsibility" for ensuring the region's security. Xi has similarly declared, "Asians have the capacity to manage security by themselves." China's leaders cite the Shanghai Cooperation Organization (SCO), the Korean Peninsula Six-Party Talks, and the Conference on Interaction and Confidence Building Measures in Asia (CICA) as examples of initiatives that support this imperative.

Security: Defense of Core Interests

Over the past ten years, China has spoken of security in terms of protecting or defending its “core national interests” (*hexin liyi*). Leaders describe those interests in various ways, but most include some variation of these three goals:

1. Preserving China’s basic state system and national security (i.e. CCP rule)
2. Protecting national sovereignty and territorial integrity
3. Maintaining international conditions for China’s economic development and protecting economic interests abroad.

The first goal concerns sustaining Communist Party rule. Chinese leaders see a range of potential domestic threats, including social unrest, natural disasters, security accidents, and public health incidents. The

Internet and social media have also challenged the CCP’s control by providing citizens with more means to share information, vent frustration, and organize protests. Leaders in Beijing are particularly sensitive to activities by foreign powers that might exacerbate threats to its control. During the 2014 Occupy Central protests in Hong Kong, for example, the Chinese Ministry of Foreign Affairs responded strongly to a British statement on Hong Kong’s electoral reform and urged the United Kingdom “to cease acts of interference in Hong Kong’s affairs.”

The second core interest is national sovereignty and territorial integrity, with Taiwan, Xinjiang, and Tibet as areas of particular concern and sensitivity. China’s 2013 Defense White Paper notes the dangerous rise of the “three forces” of terrorism, separatism, and extremism in these regions and across the country. Chinese authorities have taken a harder line on maritime claims in recent years.

Chinese leaders recognize that problems of debt, overcapacity, social discontent, and environmental degradation engendered by decades of rapid economic expansion has rendered many long-standing policies obsolete.

In line with Xi Jinping’s declaration that China will “not sacrifice an inch” of its sovereignty, Beijing has demonstrated a greater willingness to pressure rival claimants, punish perceived transgressions,



Andrew Fong/Flickr

and consolidate de-facto control of disputed maritime regions. (See “The Tip of the Spear: China’s Coast Guard Takes the Lead in East and South China Sea Disputes.”)

Finally, maintaining the accesses and resources necessary for China’s economic development is also considered a core interest. This refers to securing the economic raw materials, markets, sea lines of communication, and other resources critical to sustaining development. Threats include piracy and other nontraditional risks in China and abroad. China’s 2015 Defense White Paper urges the PLA navy to shift from only conducting “offshore waters defense” to also engaging in “open sea protection” to better safeguard the country’s maritime and overseas interests.

Conclusion: The Elusive Chinese Dream

Despite impressive economic gains accumulated over decades of rapid growth, Beijing faces formidable obstacles in realizing its policy objectives. Chinese leaders recognize that problems of debt, overcapacity, social discontent, and environmental degradation engendered by decades of rapid economic expansion has rendered many long-standing policies obsolete.

In response, PRC leaders seek to rebalance the economy and increase domestic demand to drive growth. This will require them to break up powerful special interests, improve market mechanisms, enhance research and development, and carry out other initiatives to transform the mode of economic growth. (See “The Effectiveness of China’s Policies for Developing High-Technology Industries.”)

PRC leaders also recognize that, to improve the quality of life for its people, they must reverse the immense toll taken on the country’s environment. (See “Solutions to Reducing Air Pollution in China and Their Costs.”) Structural reforms under way since 2013 led by Xi are aimed largely at breaking the power of elites and interest groups that stand to lose from reform. How the CCP resolves these issues bears directly on the people’s quality of life as well as the prosperity and stability of the country, the region, and the world.

Recommended Reading

Publications and documents upon which the authors relied in their analysis, and recommended for those desiring further reading, include:

“Xi Jinping Explains Meaning of Chinese Dream,” Xinhua, January 16, 2013.

“Highlights of the Communiqué of the Fourth Plenum,” Xinhua, October 23, 2014.

“Full Text of 17th Party Congress Report,” Xinhua, October 24, 2007.

“Full Text of 18th Party Congress Report,” Xinhua, November 17, 2012.

“Wang Yi: China, a Staunch Defender of International Rule of Law,” PRC Foreign Ministry Website, October 24, 2014. Available at: http://www.fmprc.gov.cn/mfa_eng/wjb_663304/wjbz_663308/2461_663310/t1204247.shtml

“Build a Community of Shared Destiny to Ensure Regional Peace and Stability,” *Renmin Ribao*, November 27, 2014. Available (in Chinese) at: <http://world.people.com.cn/n/2014/1127/c1002-26101342.html>

“Xi Jinping Speech at Conference on Interaction and Confidence Building Measures,” Xinhua, May 21, 2014.

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Gen. Martin E. Dempsey, chairman of the Joint Chiefs of Staff, welcomed Chinese Gen. Fang Fenghui, chief of the General Staff of the People's Liberation Army, to the Pentagon during a full-honor arrival ceremony May 15, 2014. This was the first full-honor ceremony Gen. Dempsey had hosted since 2012.

Stabilizing Military-to-Military Ties Between the United States and China

Scott W. Harold

While U.S.–China relations have broadened, deepened, and grown increasingly institutionalized since the normalization of ties in 1979, the relationship between the two countries’ militaries has been a notable exception. This underdeveloped military relationship—severed formally five times since the 1989 Tiananmen Square massacre—has been a source of growing concern for U.S. defense leaders. With the two sides operating in greater proximity as China’s armed forces modernize, the chance of an accident, misunderstanding, or miscalculation has become significant, and a weak military-to-military relationship could magnify the risk of such an unintended clash. The rapid and substantial deterioration in U.S.–China diplomatic ties in 2009–2010 added further impetus for putting a floor under the mili-

tary-to-military relationship.

In response, the U.S. Department of Defense began looking for ways to stabilize the military-to-military relationship. In early 2011, the first outlines of the department’s plan to “build greater cooperation” in the U.S.–China military-to-military relationship were described publicly in a speech by Deputy Assistant Secretary of Defense for East Asia Michael Schiffer, signaling the Pentagon’s new approach to relations with China’s military. Then–Vice President Xi Jinping articulated China’s response during his February 2012 visit to the Pentagon—a visit he reportedly insisted on despite resistance from the uniformed PLA. Xi called for China and the United States to build a “new-type great power relationship.”

U.S. defense officials viewed this development as an opportunity to push ahead with their plans to stabilize and improve U.S.–China

RAND'S RESEARCH HIGHLIGHTED TEN AREAS WHERE

Bilateral Military-to-Military Cooperation Could be Deepened

1. Leadership contacts
2. Counter-piracy
3. United Nations peacekeeping operations
4. Humanitarian assistance and disaster relief
5. At-sea search-and-rescue
6. Participation in third country-hosted exercises
7. Expanded professional military education contacts
8. Efforts to reduce pollution and energy usage
9. Military medicine
10. Semi-/un-official policy dialogues



China Disaster Management Exchange/Flickr

military-to-military ties. Shortly after Schiffer's speech, U.S. Pacific Command asked RAND to evaluate possible engagement options for stabilizing relations between the two militaries. The results of that study were documented in the 2013 article "Expanding Contacts to Enhance Durability" published in the journal *Asia Policy* and are summarized here.

A top-down, bottom-up approach


Traditionally, the Chinese People's Liberation Army (PLA) has adopted an approach to deterrence and coercion based on the view that transparency favors the powerful while ambiguity and opacity magnify a weaker force's ability to manipulate its potential adversaries. For this reason, it was widely believed that the PLA was opposed to improved military ties with the United States

as these could enable U.S. forces to ascertain and target PLA weaknesses (**see sidebar**). Moreover, because the military-to-military relationship is a function of the broader political relationship between the two countries, many analysts saw it as unlikely to improve substantially so long as the overall U.S.–China relationship continues to be plagued by high levels of strategic distrust.

Despite these reasons for pessimism, improving military-to-military relations with the PLA is possible and could contribute to reduced tensions. Based on interviews with 21 Chinese and American subject-matter experts and extensive research in U.S. and Chinese source materials, the best approach appears to be broadening contacts so as to incentivize greater stability in the military-to-military relationship. This strategy should be both top-down (focused

on more-frequent contact between the two sides' defense leadership) and bottom-up (building ties at the operational level). It should also be closely coordinated from within the U.S. Department of Defense out to the U.S. military's combatant commands (with a special lead role for Pacific Command) and across the service branches.

Such an engagement strategy should start with easier areas before moving to address more-demanding or politically sensitive ones, should be expected to produce only limited results, and would need to be sustained over an extended period of time. Finally, the U.S. military should focus on identifying and extending to the PLA symbolic opportunities for respect and "face," and be prepared to present their Chinese counterparts with an American set of "asks."



WHERE CHINA'S MODERNIZING MILITARY

Comes Up Short

Scrutiny of the People's Liberation Army (PLA) tends to focus on the large investments and huge strides it has made over the past few decades toward becoming a professional and capable fighting force. But China's military transformation is incomplete—a fact widely discussed among China's military media, academics, and even the PLA's leadership.

THE PLA'S WEAKNESSES GENERALLY FALL INTO TWO AREAS:

1. INSTITUTIONAL

The PLA's organizational structure and human capital are obstacles standing in the way of it reaching its desired level of joint operations, particularly as it attempts to project power beyond its borders. The Chinese military suffers from rampant corruption and outdated command structures, and PLA publications lament that its human capital is undereducated and lacks the technical proficiency to operate increasingly complex systems. Other shortcomings include difficulties accepting military discipline and maintaining operational security.

2. COMBAT CAPABILITIES

Chinese military publications indicate that the PLA faces gaps in joint operations capabilities, training, and support functions. These publications suggest that although the Chinese invest heavily in military hardware they struggle with the troops' ability to operate it. While new surface combatants and submarines boast impressive capabilities, the Chinese navy grapples with integrating complex modern weapons and platforms. And China's air force has made similar technological strides but wrestles with its large force of multiple generations of aircraft, a shortage of key special mission aircraft, and inadequate strategic transport capability. The PLA also faces potential weaknesses in its ability to protect Chinese interests in space and the electromagnetic spectrum, particularly cyberspace. Meanwhile, China's defense industry has made impressive advances, but still suffers from widespread corruption, lack of competition, delays and cost overruns, and quality control issues.

Although the PLA's capabilities have improved dramatically, its remaining weaknesses hinder its ability to successfully execute some of the missions Chinese Communist Party leaders may assign, including those confronting various Taiwan contingencies, maritime claim missions, sea lines of communication protection, and some noncombat operations.

However, the PLA is working aggressively to address these vulnerabilities. As the PLA continues to modernize, it is critical for U.S. analysts, planners, and decisionmakers to improve their understanding of the PLA's shortcomings—and how the PLA itself sees these weaknesses and vulnerabilities. This is key to identifying the PLA's future modernization paths; enhancing military-to-military engagement; tailoring deterrence strategies to be the most effective in influencing the Chinese leadership's decision calculus; and devising strategies for countering Chinese use of force if deterrence fails.

Adapted from Michael S. Chase, Jeffrey G. Engstrom, Tai Ming Cheung, Kristen Gunness, Scott Warren Harold, Susan Puska, and Samuel K. Berkowitz, *China's Incomplete Military Transformation: Assessing the Weaknesses of the People's Liberation Army*

Chinese People's Liberation Army (PLA) honor guard soldiers line up as they rehearse for a welcoming ceremony for New Zealand's Governor-General Sir Jerry Mateparae at the Great Hall of the People in Beijing, Tuesday, July 21, 2015.



Top: People's Liberation Army Navy (PLAN) Lt. Cmdr. Hao He, commanding officer of the Datong FFG 580, points out navigation landmarks to Chief of Naval Operations (CNO) Adm. Jonathan Greenert as he looks out on the horizon and the Datong gets underway, in Dalian, China, July 17, 2014.

Bottom: The People's Republic of China Minister of National Defense Gen. Liang Guanglie was greeted by Brig. Gen. Christopher Owens, the deputy commanding general of II Marine Expeditionary Force, upon arriving at Marine Corps Base Camp Lejeune, N.C., May 9, 2012.

The strategy that RAND developed focuses on building a coalition of actors within the PLA and the broader Chinese establishment who would have an interest in maintaining a stable U.S.–China military relationship over time, which might give China an incentive to avoid cutting bilateral military ties casually to express dissatisfaction with U.S. policy.

By accelerating the frequency of exchanges between senior-level defense and military officials to the point where the planning for the next iteration of contacts is at all times fairly advanced, the costs of canceling any given visit would serve as a disincentive to cutting off ties. At the same time, the U.S. military should strive to expand contacts with lower-ranking and operational Chinese military officers through cooperation on operational-level issues so as to gain insight into aspects of the PLA that are otherwise hard to observe. Such contacts also provide opportunities to counter the anti-America propaganda to which Chinese officers and soldiers are routinely exposed.

Of course, in order to get something of value from the PLA, the United States has to offer something of value in return. The post-Tiananmen Square massacre sanctions regime and the FY2000 National Defense Authorization Act give clear guidance and place firm constraints on the U.S. Department of Defense's ability to engage with the PLA. They ban transfers of armaments and defense technology and place barriers on any forms of contact that would improve the PLA's ability to project force, improve its war-fighting capabilities, or enhance its ability to engage in domestic repression. In light of these legal constraints, the

Top to bottom: U.S. Navy photo by Chief Mass Communication Specialist Peter D. Lawlor; Cpl. Bryan Nygaard

engagement process must necessarily concentrate on steps that are low-cost, focused on military operations other than war, and/or largely symbolic in nature. Finally, the U.S. Department of Defense should reach out beyond traditional PLA interlocutors to actors inside China who might seek to dissuade Chinese leaders from suspending the military-to-military relationship with the United States in the wake of even relatively serious disagreements.

Early Successes

Since the RAND study was published in 2013, military leaders from the two sides have traded visits at an accelerated pace, including the June visit by central military commission vice-chairman Fan Changlong, exchanges by the U.S. Secretary of Defense and the Chinese Minister of Defense; the U.S. Chairman of the Joint Chiefs of Staff and the Chinese Chief of the General Staff; service chiefs and secretaries from the U.S. Army, Air Force, and Navy, and the Chinese Navy; and the U.S. Pacific Command Commander and the commander of the Beijing Military Region. The two sides have also announced plans for a dialogue between their strategic planning departments, are planning an army-to-army dialogue, and have already carried out an expanded set of contacts between their two navies.

Operational-level contacts have also expanded. These include bilateral exercises and ship visits (with the PLA Navy visiting Honolulu and San Diego, and the 7th Fleet's *USS Blue Ridge* command ship visiting Qingdao); trilateral exercises (a ground forces-focused exercise hosted by Australia in both October 2014 and again in September 2015); and multilateral exercises,

including the PLA's participation in the Cobra Gold and the Rim of the Pacific (RIMPAC) 2014 exercise. The United States and China have also expanded their cooperation on counter-piracy; engaged in exchanges on humanitarian assistance, disaster relief, and disaster management; practiced search-and-rescue missions; discussed coordinating more closely on United Nations peacekeeping operations; consulted on military medicine; explored deepening cooperation on professional military education; and exchanged visits of cultural and athletic troupes.

Is the strategy working? It has been tested by several recent disagreements:

- The PLA is dissatisfied with the U.S. decision in April 2014 to reaffirm the applicability of its defense commitments to the Japanese-administered Senkaku Islands.
- The United States raised China's hackles in November 2013 with its response to China's declaration of an East China Sea Air Defense Identification Zone (the U.S. Air Force promptly flew two B-52s through the zone without providing advance notification).
- The U.S. Justice Department indicted five PLA officers on charges of hacking and economic espionage against U.S. firms in May 2014.
- China has continued massive artificial-island construction in the South China Sea and its intrusions into maritime areas claimed by its neighbors, including U.S. allies Japan and the Philippines.
- There is widespread suspicion in the United States that the Chinese government was behind the recent hacks of Anthem, United Airlines,

and the Office of Personnel Management.

While the hacking indictment caused China to suspend its involvement in a cybersecurity dialogue with the United States, this series of disagreements has not halted the military exchanges or caused the suspension of the broader military-to-military relationship.

Although it is still early in the period of enhanced engagement, the U.S. approach appears to be working. But patience will be required, as the depth of mistrust is substantial and the number of differing interests and values between the two sides is large. In spite of these obstacles, though, the slow, steady, top-down and bottom-up approach to increased military-to-military relations holds promise for a safer and more stable U.S.–China relationship.


Editor's Note: The essay was adapted from Scott W. Harold, "Expanding Contacts to Enhance Durability: A Strategy for Improving U.S.–China Military-to-Military Relations," *Asia Policy*, Number 16 (July 2013), 103–37.

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A large white China Coast Guard ship is shown from a low angle. On the deck, a smaller white boat with a black hull and the text "CHINA COAST GUARD" and "中国海警" is visible. A red lifeboat is mounted on the side of the larger ship. Two crew members in orange life jackets are visible on the upper deck. The ship's name "CHINA COAST GUARD" is partially visible on the side.

A crew of the China Coast Guard vessel watch a Philippine government vessel as they attempt to block the latter from entering the Second Thomas Disputed Shoals to resupply and replace Philippine Marines, March 29, 2014.

CHINA COAST GUA

CHINA'S MARITIME AMBITIONS

In 2015, the U.S. military is focused on countering the very real threat China's growing capabilities pose to U.S. forces based or operating in China's vicinity—what the Pentagon refers to as “anti-access and area denial (A2/AD).” Beijing labels this maritime region—encompassing the East China Sea, the Yellow Sea, and the South China Sea—the “near seas.” But China's naval capabilities are expanding apace, and increasingly the People's Liberation Army Navy (PLAN) is looking beyond these adjacent bodies of water to what the PLAN refers to as the “far seas.”



map: pop_top/stock

NEAR SEAS NOW

The Tip of the Spear: China's Coast Guard Takes the Lead in East and South China Sea Disputes

LYLE MORRIS AND MICHAEL S. CHASE

As the United States rebalances to Asia, one of the most challenging policy problems it and its allies confront is responding to China's provocative employment of nonmilitary capabilities in maritime territorial disputes in the East and South China Seas. This approach—using nonmilitary ships while keeping the People's Liberation Army Navy (PLAN) vessels largely in the background—allows China to intimidate its neighbors and gain leverage in these disputes at relatively low cost and with limited risk of escalation.

China used this strategy in May 2014, when it deployed a deep-water oil rig in disputed waters between the Paracel Islands and the Vietnamese coast, along with a huge flotilla of coast guard, surveillance, and fishery vessels. Chinese maritime law enforcement (MLE) ships and fishing vessels rammed Vietnamese coast guard and fishing vessels, sinking at least one Vietnamese ship. China used similar tactics to take control of Scarborough Shoal after a standoff with the Philippines in April 2012 and to assert its claims to the Senkaku/Diaoyu Islands, which are administered by Japan but also claimed by China and Taiwan.

As China seeks to defend its territorial claims more staunchly, understanding Chinese MLE strategy and how it affects regional stability is becoming increasingly important to U.S. policymakers and their counterparts in the region.

Recently Chinese vessels are increasingly adopting more aggressive actions, such as shouldering, using water cannons, ramming, and in some cases even sinking government and fishing vessels from other countries.

China Reorganizes the 'Five Dragons'

To bolster its MLE strategy, China has reorganized a number of previously separate MLE agencies into the new China Coast Guard. Before 2013, China's MLE agencies (sometimes referred to as the "five dragons") were a decentralized set of bureaucracies whose overlapping missions created problems for Chinese officials. For example, dual responsibilities and competing interests among the different agencies created infighting and competition over funding and relevance in China's push to assert its maritime sovereignty claims.

At the National People's Congress in March 2013, policymakers addressed the issue by reorganizing four of the five MLE agencies under the administrative control of the State Oceanic Agency (SOA) and renaming them the China Coast Guard (CCG). The restructure was a major step toward China's longstanding goal of establishing a unified coast guard tasked with protecting the Chinese sovereignty claims and carrying out law enforcement activities along China's maritime periphery.

Additionally, China established the State Oceanic Commission (SOC), a high-level consultative and coordinating body on maritime operations. The SOC will reportedly issue "specific tasks" to the SOA and act as a civilian-military coordinating body overseeing the overall strategy related to maritime law enforcement policy.

With the reorganization still in its infancy, many questions remain unanswered. Ships have been repainted, uniforms changed, and new nameplates set, but issues persist over integrating the different cultures, work styles, and command structures of the four agencies. Another issue is the extent to which MLE vessels will be armed. Recent deployments of CCG vessels seem to indicate that some are armed, but whether all vessels will be armed and how they might be utilized during a conflict is not clear.

PLA Cooperation with Maritime Law Enforcement Agencies

Recent training exercises highlight growing institutional interaction between the PLA and Chinese MLE forces. Even before the 2013 overhaul, the PLA had started

to cooperate with Chinese MLE agencies, in particular with China Marine Surveillance (CMS). CMS personnel have received training at PLA naval academies in Nanjing, Anhui, and Dalian since October 2009. By co-mingling law enforcement personnel with the military for education and training, the two institutions are able to overcome cultural gaps and implement standard practices to enable improved communication and coordination.

The PLAN has also conducted drills alongside MLE fleets. The first publicized large-scale joint exercise, dubbed "East China Sea Cooperation 2012," was held in October 2012. Vessels from the PLAN East Sea Fleet, the Fisheries Law Enforcement Command East China Sea Bureau, and the SOA East China Sea branch took part. The training involved a scenario in which Chinese fishing vessels were "followed, harassed, and hindered" by vessels from another country, according to *China National Radio Online*. PLAN frigates then "quickly took up positions right and left of the Marine Surveillance and Fisheries Law Enforcement vessels and warned, monitored, intimidated, and blocked" the foreign vessels, the news report said. Such drills illustrate Beijing's aspiration to integrate the command and control of Chinese military and civilian law enforcement agencies to more effectively conduct sovereignty protection and law enforcement patrols in disputed waters.

Evolving Rules of Engagement

One key issue that should concern policymakers is the rules of engagement (ROE) that Chinese MLE personnel adopt in the East and South China Seas. Chinese MLE vessels

RECENT TERRITORIAL DISPUTES ROIL THE WATERS

Some notable skirmishes with Japan, the Philippines and Vietnam:

APRIL 2012: Two Chinese surveillance ships block a Philippines Navy ship at the disputed Scarborough Shoal after the Navy vessel attempted to intercept eight Chinese fishing boats harvesting coral, giant clams, and live sharks at the reef. Manila and Beijing break the standoff by withdrawing their ships, but China continues to deploy vessels at the shoal and retains effective control over it.

SEPTEMBER 2012–PRESENT: Japan nationalizes three islands in the Senkaku Islands chain, prompting China to issue a diplomatic demarche and dispatch large numbers of maritime law enforcement vessels in an attempt to assert administrative control.

MARCH 2014: The China Coast Guard attempts to block a Philippines military mission to resupply and rotate a Marine detachment stationed at Second Thomas Shoal—an unprecedented challenge to the Philippine presence on the reef. Philippine Marines have stood watch at the shoal since 1999 aboard an old tank landing ship purposely grounded there as an outpost.

MAY 2014: China positions an oil rig about 120 nautical miles off Vietnam near the Paracel Islands, an archipelago both nations claim. Up to 120 Chinese maritime law enforcement vessels supported by aircraft and helicopters establish a cordon around the rig that prevents Vietnamese vessels from approaching. Chinese vessels fire water cannons, ram ships, and even sink vessels to keep the Vietnamese Coast Guard and fishing ships at bay.

A Chinese vessel approaches a Vietnamese Coast Guard patrol ship near an oil rig (right, background) installed by China off the Paracel Islands in South China Sea on May 28, 2014.





Renato Etac, who says Chinese vessels routinely chase and try to ram the small fishing boat he captains, docked on Subic Bay in Olongapo, Philippines, August 8, 2015. "I can't even count the Chinese ships I see, there are so many," said Etac.

have until recently taken a relatively nonconfrontational approach with other countries' fishing and law enforcement vessels. However, changes to Chinese ROE became discernible around 2011. Before, Chinese ROE were focused primarily on 1) querying other vessels of their purpose for deployment; 2) declaring Chinese sovereignty; and 3) engaging in close-proximity maneuvering. But recently Chinese vessels are increasingly adopting more aggressive actions, such as shouldering, using water cannons, ramming, and in some cases even sinking government and fishing vessels from other countries.

This activity became more visible during the 2012 Senkaku/Diaoyu Island dispute with Japan and with the Scarborough and Second Thomas Shoal incidents with the Philippines, though Beijing seems to want to avoid further escalating its confrontations with both Tokyo and Manila. More-aggressive activity also became more routinized during the May 2014 oil rig standoff with Vietnam, which suggests a greater level of risk acceptance, at least when it comes to Hanoi. During the standoff, dozens of Chinese MLE vessels repeatedly harassed, surrounded, and rammed Vietnamese vessels that entered the self-declared Chinese buffer zone around the oil rig. Most notably, nongovernmental vessels, such as maintenance and supply ships, trawlers, and even tugboats, have adopted some of the more aggressive tactics. In one case, a large Chinese fishing trawler presumed to be owned by the Shandong Homey Aquatic Development Co. Ltd. rammed and sank a wooden Vietnamese fishing vessel; the Vietnamese coast guard saved the crew.

The evolution to more-aggressive ROE, especially with respect to Vietnam, indicates increasing confidence on the part of China's MLE commanders and captains of their ability to employ ever-increasing escalatory measures without triggering military retaliation. Furthermore, the actor involved may dictate the type of ROE adopted. For example, China may calculate that it can successfully carry out more-aggressive ROE tactics with non-U.S. allies (such as Vietnam) than with U.S. allies (such as Japan or the Philippines). Finally, the involvement of nongovernment-affiliated vessels, such as fishing, tugboat, and maintenance vessels, represents a new—and potentially risky—tactic in which Chinese government entities can claim immunity while still engaging in escalatory behavior that successfully deters other countries' vessels. This raises questions about the degree to which nongovernment vessels receive guidance from the CCG.

Deter, Defend, and Ally

China's reliance on nonmilitary capabilities to project power in the East and South China Seas leaves the United States and its allies confronting a series of policy and strategy challenges. One is how to develop approaches to deter Chinese nonmilitary but coercive actions. Another is how to respond if deterrence fails.

In rising to these challenges, the United States and its allies should consider approaches calibrated to decisively influence Chinese behavior without running unnecessarily high risks of further escalation. These could include activities such as

- Increasing the level of risk or uncertainty Chinese decisionmakers must accept when they engage in coercive tactics
- Helping allies and partners improve their own MLE capabilities by providing more modern and capable vessels and the training to operate them
- Assisting allies and partners with the development of maritime domain awareness and communications capabilities
- Promoting ties among allies and partners by encouraging more powerful countries to provide equipment and training to less capable countries in the region.

Recommended Reading

Other publications that have examined various aspects of coast guard and maritime law enforcement developments in the Asia-Pacific include:

Ryan Martinson, "Here Comes China's Great White Fleet," *The National Interest*, October 1, 2014.

Bonnie Glaser, and Brittany Billingsley, "The Promise and Peril of China's New Coast Guard," *The Diplomat*, August 7, 2013.

Lyle J. Goldstein, "Non-Military Escalation: China Cultivates New Heft in Civil Maritime Forces," *China Brief*, Vol. 12, No. 23, November 30, 2012.

Lyle J. Goldstein, "Five Dragons Stirring Up the Sea: Challenge and Opportunity in China's Improving Maritime Enforcement Capabilities," U.S. Naval War College, China Maritime Studies Institute, No. 5, April 2010.

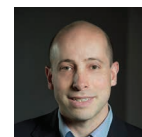
Editor's Note: This essay was adapted from Lyle Morris, "Taming the Five Dragons? China Consolidates its Maritime Law Enforcement Agencies," *China Brief*, Vol. 13, No. 7 (March 28, 2013).

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A Jian-15 fighter jet takes off from China's first aircraft carrier, the *Liaoning*, during a sea trial in Qingdao in east China's Shandong province on Saturday, Sept. 21, 2013.

FAR SEAS FUTURE

Nascent Aircraft Carrier Program Reveals
China's Grand Ambitions

ANDREW SCOBELL AND CORTEZ COOPER

The People's Liberation Army Navy (PLAN) is experiencing a “paradigmatic change” (*zhuanxing*) in naval thinking from the “near seas” (*jinhai*)—encompassing the East China Sea, Yellow Sea, and the South China Sea—to the “far seas” (*yuanhai*), according to an authoritative Chinese military publication. One of the most dramatic indicators of its far seas ambitions is China's aircraft carrier program.

The PLAN commissioned its first carrier, the *Liaoning*, to great fanfare in September 2012. The *Liaoning* is reportedly the first of as many as five planned aircraft carriers. What does this program tell us about China's far seas intentions and expanding naval capabilities?

Four observations come to mind when considering PLAN drivers and goals and what China's naval ambitions and capabilities mean for the United States.

1. China's carrier program has been driven by an overarching strategic logic reinforced by great-power aspirations and bureaucratic initiatives.

Beijing views an aircraft carrier as a necessary accoutrement of a great power. It would be “completely unthinkable,” according to Major General Zhang Shiping of the Academy of Military Science, “for China to become a major world power without an aircraft carrier.” This platform has come to symbolize

In this Tuesday, Nov. 26, 2013 photo, a crew member of Chinese People's Liberation Army (PLA) Navy monitors on the deck of the China's aircraft carrier, the *Liaoning*, sailing on the East China Sea for sea trials.



CHINA'S AIRCRAFT CARRIERS Where Are They Now?

Year	Ship purchased	Cost	Status
1985	<i>HMAS Melbourne</i>	\$1 million	closely inspected, scrapped
1998	<i>Minsk</i>	\$5 million	tourist attraction
1998	<i>Varyag</i>	\$20 million	completely refurbished as <i>Liaoning</i>
2000	<i>Kiev</i>	\$8.4 million	tourist attraction

the overwhelming dominance that the U.S. Navy has long enjoyed over the PLAN. To Beijing, aircraft carriers are the primary vessels by which the United States intimidates

China's far seas ambitions are propelled less by expansionism than by a growing desire to protect Beijing's far-flung interests, which now stretch around the globe.

China in a latter-day version of gunboat diplomacy that harkens back to the Century of Humiliation, when Western powers bullied China into signing the so-called unequal treaties.

The Chinese carrier program was the pet project of the most powerful PLA flag officer of the post-Mao reform era: Admiral Liu Huaqing (1916-2011), who is revered as the "father of Chinese aircraft carriers" and "China's Mahan," after Alfred Thayer Mahan, a prominent U.S. Navy admiral and geostrategist. Liu first floated the idea of China acquiring a carrier in 1970, according to his memoirs. While his suggestion gained no traction at the time, Liu persisted, and by the time he retired

as vice chair of the Central Military Commission in 1997, acquiring a carrier had become a high-priority goal for Beijing.

But what ultimately powered China's carrier program into being was an overarching and evolving strategic logic. While nationalism and bureaucratic interests have played—and continue to play—important roles in the program's trajectory, the push for a Chinese carrier could not have been sustained across many decades and ultimately triumphed without the impetus of a larger strategic rationale and the emergence of a coherent naval strategy.

In the early 1980s, Admiral Liu set a course for this naval strategy, a

course in which the PLAN would gradually extend its reach into the Pacific Ocean in a phased expansion of Chinese power. In the first phase, by 2000, the PLAN was to extend its area of operations in the near seas as far as the so-called First Island Chain: the Kuril Islands, Japan, the Ryukyu Islands, Taiwan, the Philippines, Borneo, and Indonesia's Natuna Besar. In the second phase, by 2020, the PLAN aimed to project its operational reach to the so-called Second Island Chain: the Bonins, the Marianas, and the Carolines. In the third phase, by 2050, China would be a global sea power on par with the U.S. Navy. To date, the PLAN's efforts have put it on a trajectory to coming close to meeting this timeline.

2. The carrier program emphasizes that China has serious medium- and long-term naval ambitions that extend well beyond its immediate neighborhood.

A key observable indicator of Beijing's degree of determination is the level of effort it has put toward an expensive and input-intensive naval power projection platform. Between 1998 and 2000, for example, various Chinese entities separately purchased three Soviet-era aircraft carriers. The cost of these acquisitions—the *Minsk* and *Varyag* (both in 1998), and the *Kiev* (in May 2000)—reportedly totaled some US\$33.4 million. All of this suggests a degree of high-level coordination. The *Varyag*, which became the *Liaoning*, was purchased by the Chong Lot Tourist and Amusement Agency, where several retired PLAN officers sat on the board of directors. Ostensibly, the *Varyag* was to become a floating casino in the gambling mecca of

Macau, located in southern China not far from Hong Kong. However, when the *Varyag* eventually arrived in China in early 2002 it docked well away from Macau—in the northern port of Dalian.

This flurry of activity and subsequent substantial investment—probably in the range of \$100 million—in completely refurbishing the former Soviet-era hulk indicate that Beijing is very serious about an aircraft carrier program.

China's far seas ambitions are propelled less by expansionism than by a growing desire to protect Beijing's far-flung interests, which now stretch around the globe. China has become increasingly enmeshed in the global economic system, and the lion's share of its trade is seaborne. By 1993, the PRC had become a net importer of petroleum. All this signaled China's growing dependence on the sea lines of communication radiating through the near seas and beyond the First Island Chain. China's growing oceanic interests have fueled expanded operational demands for the PLAN at greater distances from home ports. These missions include protecting China's fishing and merchant fleets.

3. China's carrier program underscores the rising level and increasing complexity that the PLA's growing capabilities are starting to present to the U.S. Navy

In 2011, then-PACOM commander Admiral Robert Willard observed that when a Chinese carrier did come on-line, the psychological impact on the Asia-Pacific region would probably be more significant than its operational impact. Not since the end of the Cold War more than 20

years ago has the U.S. Navy faced the specter of a non-allied navy that has surface and subsurface platforms with global reach. In the coming decades, U.S. Navy vessels will increasingly share the high seas with PLAN vessels.

Nevertheless, the *Liaoning* itself will have little if any operational impact in the short term; it primarily is to serve as a training platform for the first three to five years and will operate mostly within the First and Second Island Chains. Most operational PLAN ships have three-digit Arabic numeral identifiers, but the *Liaoning* has a two-digit identifier (16), indicating it is officially viewed as a training vessel. Moreover, a second carrier, currently under construction, is unlikely to come into service for at least five to six years. But the PLAN is working to muster new platforms—surface vessels, submarines, aircraft—and operational capabilities (including ballistic and cruise missiles) together in ways that will make any prospect of confrontation or tangle with the PLAN increasingly difficult for the U.S. Navy. Greater attention by the Pentagon to the so-called “anti-access and area denial (A2/AD) challenge” highlights that China's military can hold at risk U.S. platforms operating in the Western Pacific.

In peacetime, an aircraft carrier provides a high-profile presence wherever it steams. A Chinese carrier would symbolize China's power and commitment without necessarily raising alarm. But the challenge in the not-too-distant-future will be how to operate a carrier close to home without being perceived as threatening by China's neighbors. While a carrier is much more likely to be warmly welcomed outside the First and Second Island Chains than within them, the vast distances



In this TV grab taken on November 28, 2013, China's first aircraft carrier the *Liaoning*, enroute to the South China Sea, passes through the Taiwan Strait. The ship was on its way to a training mission in the South China Sea. It took about 10 hours for the carrier and its four escort ships to get through the strait separating the Chinese mainland and Taiwan. It was escorted by two missile destroyers, the *Shenyang* and the *Shijiazhuang*, and two missile frigates, the *Yantai* and the *Weifang*.

involved in far seas operations will also provide the greatest challenges to Chinese carriers, with refueling being the key issue (U.S. carriers are all nuclear-powered and far less constrained in their mobility, although fuel for aircraft does need to be resupplied). A carrier operating off the coast of Africa or Latin America would be a strong symbol of Chinese national pride and could also serve as a goodwill ambassador, whether in port visits or in patrolling the global commons.

4. China's growing naval capabilities expand both opportunities for cooperation and potential for confrontation with the navies of the United States and other states.

There are great opportunities for the PLAN to cooperate with the international community in peacetime noncombat operations. The PLA has neither had recent warfighting experience nor does it anticipate

significant combat operations in the foreseeable future. Thus the *Liaoning* and any subsequent Chinese aircraft carriers can expect considerable noncombat operations. Since at least 2008 China's armed forces have emphasized military operations other than war (MOOTW) as an increasingly important doctrinal component for the PLA. These MOOTW missions for China's navy include protecting sea lines of communication and conducting humanitarian assistance/disaster relief. China became acutely aware of the value of an aircraft carrier during the U.S. Navy's response to the Southeast Asia tsunami in 2004. Recent PLA experiences with noncombatant evacuations in places such as Libya in 2011 have also highlighted the value of air and naval assets.

The *Liaoning's* short takeoff and arrested recovery (STOBAR) design suggests that its missions will be more limited than those of U.S. aircraft carriers. A ski jump and the absence (to date) of catapults limit the size and weight of aircraft that can take off from the deck (which restricts the payload and amount of fuel a jet can carry). Thus, the on-board aircraft will focus on air defense missions to protect the carrier and to escort vessels during operations at sea. Moreover, the *Liaoning* is conventionally powered, which limits its range and necessitates regular refueling.

China's first carrier also provides added value in wartime. Most significantly, a carrier offers the PLAN extended capability on the high seas and an improved capacity for anti-submarine warfare (ASW) and airborne early warning (AEW) support. However, ASW and AEW require multiple carriers, and the *Liaoning's* size and configuration

Adding carriers to an already sizeable non-allied navy operating in the same waters will only further complicate the operating environment for the U.S. Navy, especially during any state of heightened tensions between Washington and Beijing.

preclude the launch of larger aircraft that would perform these missions. Nevertheless, a fully operational aircraft carrier can provide the PLA's first steps toward extended air and air defense cover for operations in the Asia-Pacific. This includes a modest increase in air defense for escort vessels. However, vulnerabilities in anti-submarine warfare and airborne early warning remain too great for the *Liaoning* to be successfully employed in high-intensity maritime combat. In short, there are limitations to what one aircraft carrier can do, especially one deployed with only modest operational experience.

Conclusion: Greater Opportunities for Cooperation—and Conflict

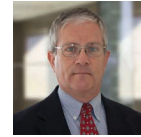
Driven by a dominant strategic logic, China's navy is moving toward a far seas future. One of the most tangible pieces of evidence is the PLAN's

carrier program. The program's lengthy gestation and repeated early failure to gain traction are attributable to the absence of a strategic imperative until the end of the Cold War. This mounting strategic rationality and the emerging operational demands in the 21st century for a carrier program correspond to a rise in PLA thinking beyond a Taiwan Strait scenario. When China's military was narrowly focused on operations against Taiwan, an aircraft carrier did not make much sense. But the operational value of a carrier is more evident in other scenarios, especially beyond the First Island Chain. Moreover, the strategic and operational value increases as the PLAN expands its horizons beyond the First and Second Island Chains.

Adding carriers to an already sizable non-allied navy operating in the same waters will only further complicate the operating environment for the U.S. Navy, especially during any state of heightened tensions between Washington and Beijing. However, this will not fundamentally shift the balance of forces in the Asia-Pacific. Chinese carriers signal the emergence of an increasingly global-oriented PLAN. The result will be increased opportunities for cooperation in peacetime and greater challenges for the U.S. military in any future conflict.

Editor's Note: This essay was adapted from Andrew Scobell and Cortez Cooper, "Carrier Dreams or Coherent Naval Strategy? China's Aircraft Carrier Program and What It Means for Taiwan," in Monique Chu and Scott Kastner, eds., *Globalization and Security Relations Across the Taiwan Strait* (Routledge, 2015).

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Aerial view of a junkyard piled high with scrapped vehicles in Hangzhou city, east China's Zhejiang province, March 19, 2015. As China is stepping up environmental protection levels to fulfill its commitment of curbing pollution, an increasing number of pollutive vehicles have been removed from roads and scrapped.

Solutions to Reducing Air Pollution in China and Their Costs

Keith Crane

PM2.5 Value [$\mu\text{g}/\text{m}^3$]

WORLD HEALTH ORGANIZATION
ACCEPTABLE
AIR-QUALITY
LEVEL

Air pollution is one of the most pernicious consequences of China's past three decades of economic transformation and explosive growth. Although China's federal, provincial, and municipal governments have made considerable efforts and air quality has im-

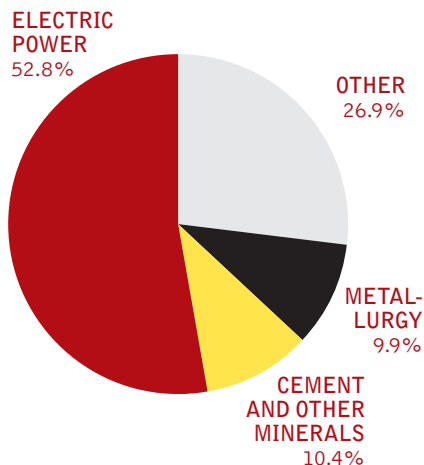
proved by some measures, concentrations of pollutants in virtually every major urban area exceed the standards recommended by the World Health Organization (WHO).

To illustrate the extent of air pollution, consider just one pollutant: particulates less than 2.5 microns in size (PM2.5). In the past few years peak

SOURCE:
U.S. Embassy
in Beijing.

2008 2009 2010 2011 2012

Major sources of sulfur dioxide emissions in 2010



SOURCE: China Environmental Statistical Yearbook, 2010, Emission and Treatment of Waste Gas tables.

concentrations of PM_{2.5} in Beijing have exceeded WHO's standards of 25 parts per cubic meter of air by as much as 40 times.

China's extreme air pollution takes a substantial toll on its citizens' health. A recent study found that life expectancy there plummets three years for every additional 100 micrograms of total suspended particulate matter (TSP) of all sizes. The same study found that very high levels of TSP in northern China, where air quality tends to be worst, have reduced life expectancy there by an average of 5.5 years compared to the south (which is heavily polluted itself).

The health and other economic costs of air pollution totaled 6.5 percent of China's gross domestic product (GDP) each year between 2000 and 2010. The related costs of health care, shorter lifespans, lost productivity from missed work, and damage to buildings, equipment, and farmland added up to an estimated \$535 billion in 2012. And these costs—especially for health care—are rising as more Chinese move to urban areas, where they are exposed to poorer air quality. Economic costs are also climbing as lost work time and the shortened lifespans of China's increasingly productive workforce impose a higher toll.

What Are the Main Sources of Pollution?

Electricity generation accounts for most emissions of sulfur dioxide, a key pollutant in China. Together, power generation, cement production, and metallurgy account for almost three-quarters of this pollutant. Coal is the main source of both sulfur dioxide and TSP emissions. Between 1990 and 2010, China's coal consumption tripled. Although

the installation of pollution control equipment on power plants has reportedly curtailed emissions of TSP, emissions of sulfur dioxide from power plants rose 31 percent over this period due to increased consumption, and concentrations of TSP have remained high.

In China's urban areas, households and small businesses produce a disproportionate share of TSP emissions because they burn coal, industrial and household waste, and wood and biomass for cooking and heat, which generate greater emissions than do alternatives such as natural gas or propane. In 2011, households and commercial establishments burned 114 million tons of coal—3.2 percent of the coal consumed in China.

On another front, the number of vehicles in China has skyrocketed from 17.4 million in 2004 to 126.7 million in 2013, according to the China Statistical Yearbook. As a result, they have become an increasing source of urban air pollution, especially nitrogen oxides, volatile organic compounds, and TSP from diesel engines. And while China has followed European Union standards for cars and trucks and, like the EU, has progressively tightened emission standards for new cars, 14.5 million older vehicles with only rudimentary pollution control equipment or none at all remain on the road; though they comprised less than 10 percent of China's vehicles in 2011, they accounted for nearly half of all emissions.

What Can China Do?

The government has been implementing anti-pollution measures similar to those of other industrialized economies:

- Subsidizing or mandating the use of cleaner fuels such as natural gas, nuclear, and renewables
- Mandating pollution-control equipment on major point sources and motor vehicles
- Requiring that older vehicles, boilers, and other high-emission equipment be scrapped

For China's urban air quality to reach safe levels, more aggressive implementation of these policies is necessary. We evaluated the effects and costs of three strategies.

Policy 1: Substituting natural gas or propane for coal for residential and commercial use

To meet WHO's air quality standards, residential and commercial users must stop burning coal, biomass, and plastic waste in urban areas. Most countries have found that effectively reducing emissions from urban boilers used for heating and hot water requires replacing coal with natural gas, propane, or other cleaner fuels. To replace the 114 million tons of coal burned by households and commercial users in 2011, China would have needed an additional 88 billion cubic meters of natural gas—60 percent more than the 147 billion cubic meters of natural gas it consumed in 2012.

Policy 2: Replacing coal with cleaner fuels to generate electricity

Half of the coal combusted in China generates about 79 percent of its electricity. To reach healthy air quality levels, China needs to replace a substantial amount of coal-fired power, especially in or near major population centers, with power from cleaner sources.

Coal generates a much smaller share of electricity in the United

States—40 percent in 2013—and many countries in Europe. To match the U.S. figure, China would have had to reduce coal-fired generation by 39 percentage points, or 1.918 trillion kilowatt-hours (KWh), in 2012. This would require substantial additions to China's generating capacity from other sources but would have great benefits. Retiring the worst-performing coal-fired plants near cities could reduce national emissions of particulates and sulfur dioxide by well over 25 percent and substantially improve urban air quality.

How much energy from other sources would be needed to replace coal-fired plants? Expanding hydroelectric power capacity from 249 gigawatts (GW) to 325 GW, which China is currently planning, would generate an additional 0.264 trillion KWh, equivalent to 5.3 percentage points of coal-fired power in 2012. Expanding wind could generate 0.996 trillion KWh, or 20 percent of the electricity China generated in 2012. China would need to install an additional 540 GW of wind capacity beyond its 2012 capacity of 62 GW to reach this goal. Nuclear power plants could supply the difference—0.658 trillion KWh, or 15.2 percent of China's 2012 electric power output. To achieve this goal, 84 GW of additional nuclear capacity would be needed—45 percent more than China's current goal of an additional 58 GW by 2020. These estimates do not take into account greater demand for electricity from continued economic growth. However, in 2013 and 2014, growth in demand for electricity in China moderated to the point that consumption of coal has dropped.

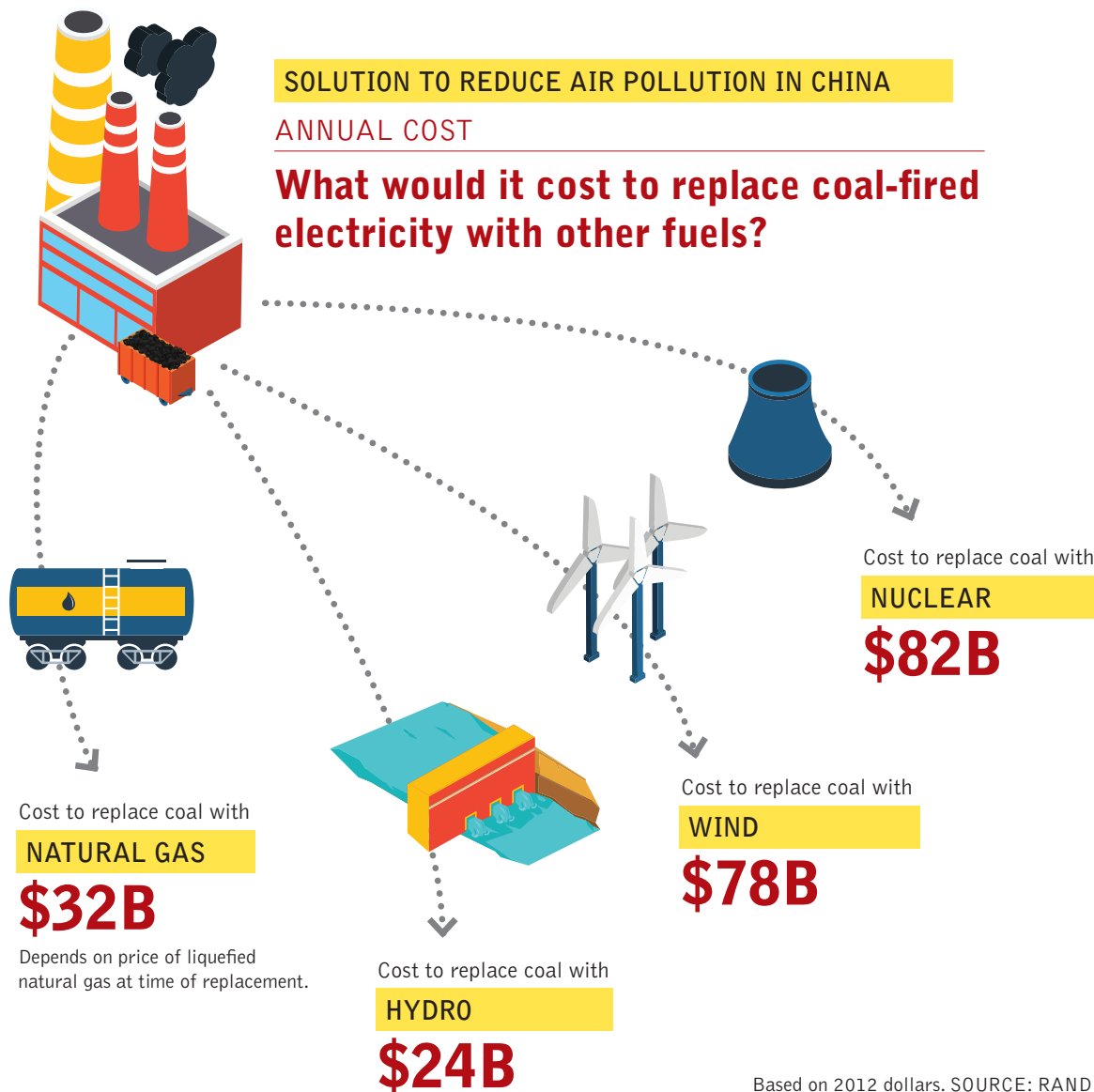
Policy 3: Scrapping older vehicles
Most motor vehicles sold in China

are manufactured by joint ventures between international automakers and Chinese companies, so Chinese producers have access to their partners' pollution-control technologies. In fact, the most stringent technologies are already being installed on vehicles sold in Beijing and other cities, where reducing vehicle emissions is a priority.

Scrapping the 14.5 million older vehicles with little or no pollution control equipment is the most efficient way to reduce air pollution from existing vehicles. In 2009, this would have eliminated 70 percent of carbon monoxide, 70 percent of volatile hydrocarbons, 61 percent of nitrogen oxides, and 76 percent of particulate matter emitted by cars and trucks.

How Much Would These Policies Cost to Implement?

The measures proposed here, which have already been partially implemented by national or municipal governments in China, will reduce urban concentrations of particulate matter, sulfur dioxide, and nitrogen oxides by at least a quarter and probably much more. But they do not come without cost. For example, we estimate that the recurring annual costs could run as much as \$32 billion for replacing coal with natural gas for residential and commercial heating, and \$184 billion for replacing half of China's coal-fired electric power generation with renewables or nuclear power. Combined, total recurring costs could be \$215 billion annually. Subtracting the value of the coal (\$75 billion) for which these fuels would substitute, net annual costs in aggregate would run \$140 billion to \$160 billion annually. However, the costs of air pollution in China exceed \$535 billion annually, so these



investments represent less than one-third of that amount.

China is well on its way to scrapping older, highly polluting cars and trucks. More than a third of these vehicles that were on the road in 2012 are to be scrapped by the end of 2015, and all should be gone by the end of 2017. However, getting the worst-polluting cars and trucks off the road even sooner would be beneficial. China may wish to implement “cash-for-clunkers”-style limited buyback programs, like the one in Dongguan, Guangdong province, to accelerate the process. The one-off

costs of scrapping highly polluting vehicles could run from \$21 billion to \$42 billion.

Which Proposed Policy Should Take Priority?

Of the three policy initiatives discussed here, the near-term priority should be substituting natural gas or propane for coal or other solid fuels for residential and commercial use. Ending the use of these fuels would substantially improve air quality in urban areas, especially in winter months, greatly reducing the number of days when air quality is extremely bad.

The cost of this policy would primarily fall on urban residents, and, to a lesser extent, commercial establishments in the form of increased costs for heating and hot water. However, these are precisely the individuals who suffer most from air pollution. Municipal subsidies for expanding natural gas distribution networks or purchasing new furnaces would alleviate some of the burden. At \$32 billion a year, the costs of this policy would run about \$50 per capita for urban dwellers, or \$4 per month. Although not inconsequential, the costs are manageable for most urban dwellers in China. Lower health

SOLUTION TO REDUCE AIR POLLUTION IN CHINA

A ONE-TIME COST

What would it cost to scrap old vehicles?

Based on 14.5 million vehicles

\$21B



If older vehicles are all cars

\$42B



If older vehicles are all trucks

Based on 2012 dollars. SOURCE: RAND Calculations

costs (which could conceivably offset the price of the policy) suggest this would be very beneficial from both economic and health perspectives.

At \$184 billion, the cost of replacing coal-fired power with hydro, wind, and nuclear is the most expensive of the three policies we evaluated, but it would contribute most to reducing overall emissions of TSP and sulfur dioxide. However, the impact on urban air quality might not be as great as the expected decline in emissions suggests because most Chinese power plants are not in urban areas. Although wind-borne air pollution from coal-fired plants is a major factor in urban air quality, abating pollution sources within the city limits would generally have a more direct impact. The costs of a greater move away from coal-fired power would be borne more widely than those of the residential and commercial changes; electricity would grow more expensive, cutting into the profits of the energy-intensive manufacturing sector and

increasing the energy costs of all Chinese households. On balance, ending the use of coal for residential and commercial purposes within urban areas is likely to be the higher near-term priority.

At \$21 billion to \$42 billion, expediting the retirement of highly polluting vehicles is the least expensive measure, and the cost is diminishing by the day since the vehicles are already being steadily scrapped. That said, if expeditiously implemented, programs to accelerate retirements would still have positive benefits.

After decades of tradeoffs between China's economic growth and the costs to its citizens' health and the environment, the bill is coming due. Economically, pollution is taking a daily toll through greater health care costs, shorter lifespans, lost productivity, and property damage. Socially, the issue has generated political pressure as China's increasingly affluent population demands better. China would benefit from stepping

up its efforts to undo the damage.

Editor's Note: This essay was adapted from Keith Crane and Zhimin Mao, *Costs of Selected Policies to Address Air Pollution in China* (RAND Corporation, 2015; available at www.rand.org/t/rr861).

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Chinese workers install solar panels at a photovoltaic power station in Hengfeng county, Shangrao city, east China's Jiangxi province, March 28, 2015. Beijing in March announced a solar installation target of 17.8 gigawatts (GWs) for 2015, up 70 percent on the previous year, to boost the use of renewable energy and prop up China's solar panel industry, the world's largest.

The Effectiveness of China's Policies for Developing High-Technology Industries

Keith Crane

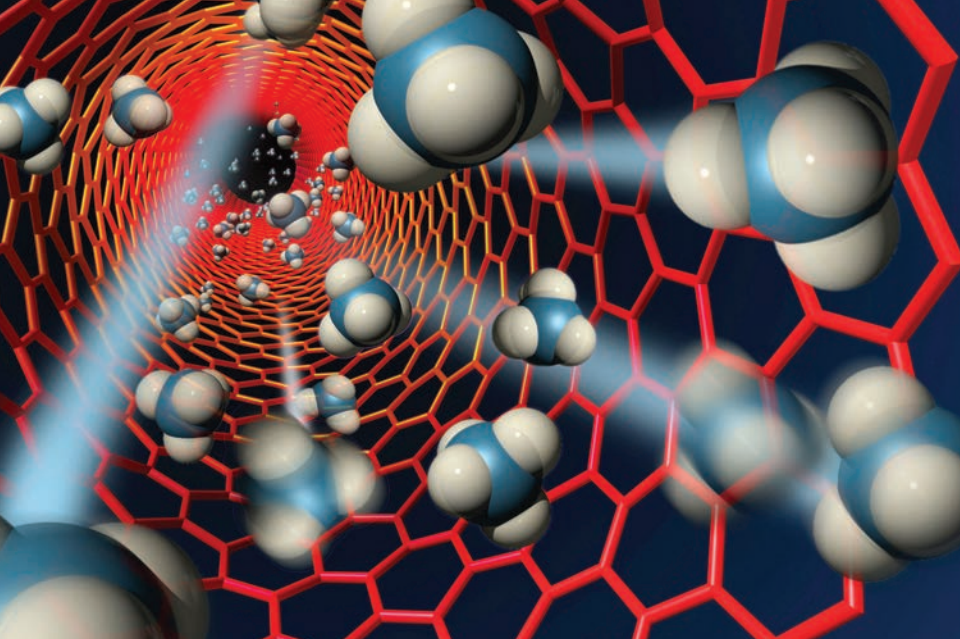
In an effort to restore higher growth rates, raise per capita incomes, and reduce pollution, the Chinese government has staked out the goal of transitioning from the lower-value, lower-wage manufacturing economy of its recent past to a mixed industrial and service economy. Future growth is to be driven more by innovation in its many forms than by investment and the continued reallocation of low-skilled labor from agriculture to manufacturing.

But this leaves China facing a crucial question: Will its investments in this transition pay off in a climate of strong competition from neighboring economies? We examined two areas where China is focusing its efforts: Economic Development Zones and developing “national champions” among industries it views as strategic.

Economic Development Zones

Since China's economic reforms began in 1978, the government has used a variety of policy instruments to foster innovation. One key instrument for experimenting with economic policies in general and policies to spur technological change and innovation, in particular, is the economic development zone (EDZ).

EDZs have generated a substantial share of China's industrial output and value-added exports, and they have also attracted a large share of foreign direct investment. While the initial focus of EDZs was to attract foreign direct investment and expand manufacturing and exports, of late, the aim has been to encourage the migration of industries to China's poorer western provinces and to foster the growth of high-technology industries.



7 Tech Industries Worth China's Time

In work RAND conducted for the Tianjin Binhai New Area and its Tianjin Economic-Technological Development Area, we identified the most-promising emerging technology applications to pursue as part of their plan for growth. Seven emerged as particularly promising:

1. CHEAP SOLAR ENERGY

2. ADVANCED MOBILE COMMUNICATIONS AND RADIO-FREQUENCY IDENTIFICATION PLATFORMS

for sensing, processing, storing, and communicating multiple types of data

3. RAPID BIOASSAYS

tests to quickly detect the presence or absence of specific biological substances

4. MEMBRANES, FABRICS, AND CATALYSTS

to desalinate, disinfect, decontaminate, and help ensure water quality

5. MOLECULAR-SCALE DRUG DESIGN

development and delivery

6. ELECTRIC AND HYBRID VEHICLES

7. GREEN MANUFACTURING PROCESSES

that minimize waste and environmental pollution while optimizing the use and reuse of resources

What can China do to help its EDZs achieve the latest goal of fostering innovation? Consider the case of the new Sino-Singapore Guangzhou Knowledge City. Jointly developed by the Guangzhou Development District (GDD) and Singbridge of Singapore, Knowledge City is to be an environmentally and technologically advanced city that hosts innovative industries and the knowledge workers that staff them.

RAND worked with the GDD to identify how public policy levers could be engaged to create a center of innovation. We proposed three goals (and several policy actions for realizing them) for fostering innovation in this new EDZ:

1. attract high-technology companies and enable their growth
2. attract and retain highly skilled, innovative people
3. ensure the availability of innovation-oriented financing.

To foster the growth of clusters of high-technology companies, GDD must attract an anchor institution or institutions (defined as a prominent company, research institution, or university that will attract researchers and suppliers), and improve the overall innovation environment. A new government office could be created to assist companies with all legal, administrative, and financing issues, providing each investor with a case worker to help the investor obtain the benefits for which he qualifies and give other individualized assistance. To allay concerns about intellectual property rights, an area in which China has performed poorly, we recommended that GDD declare Knowledge City an enforcement zone and expand assistance for international patenting.

To attract and retain innovative people, GDD should adopt policies that directly attract new talent (especially from among Chinese returning from abroad), enhance labor flexibility, and facilitate the creation of networks. To help formulate these policies, we proposed that GDD create an advisory council for Knowledge City composed of foreign and domestic investors. Due to their greater education and incomes, skilled workers expect a high quality of life, so Knowledge City will require first-rate schools, urban amenities, and entertainment opportunities. GDD must also ensure adequate and frequent rail connections between Knowledge City and the rest of Guangzhou, as many knowledge workers will have spouses who work in other parts of Guangzhou.

To ensure the availability of innovation-oriented finance that will help entrepreneurs overcome the challenges of accessing early-stage financing, GDD could create formal networks of angel investors who regularly review promising investment opportunities. International experience shows mixed results from government-sponsored venture funds; private venture capital has been better able to judge business prospects and risks. One way to involve private venture capital is by forming partnerships between foreign or domestic firms and government-sponsored firms. Even if innovation-oriented financing is available, innovative firms will still need commercial banking services, so Knowledge City will need a competitive commercial banking presence.

Developing ‘National Champions’

Improvements in the quality of China’s workforce, manufacturing

technologies, and materials have enabled the country to enter more technologically sophisticated industries. To spur several high-tech industries that the Chinese government has denoted as strategic, the government has employed industrial policies, both formal and informal, to foster the development of *national champions*—state-owned companies that are to develop internationally competitive products and become global leaders in high technology industries. As part of this strategy, the Chinese government has attempted to induce the transfer of technologies from foreign manufacturers to Chinese companies. To the extent that these policies have been successful, they have accelerated shifts in production and employment from industries in other countries to China.

Consider a case study of one of these national champions: the country’s emerging commercial aviation manufacturing industry. Although China’s government has had a long-standing interest in manufacturing commercial aircraft, to date it has not had much success. Until recently, the industry produced aircraft almost exclusively for the Chinese military, so almost all commercial aircraft have to be imported. In 2008, China created a state-owned commercial aircraft manufacturing company, the Commercial Aircraft Company of China (COMAC), to build a regional jet, the ARJ-21, already under development, and a narrow-bodied aircraft, the C919.

To advance the industry, China adopted a strategy of first engaging in domestic production and assembly using foreign designs, then developing its own designs with foreign assistance, culminating in completely independent local development of a

commercial aircraft without foreign assistance. To create a domestic commercial aviation manufacturing industry, the Chinese government has employed the following policy instruments:

- Tasking COMAC with becoming a global competitor in the commercial aircraft manufacturing industry
- Providing subsidized loans and equity to COMAC
- Compelling state-owned airlines to purchase Chinese aircraft
- Targeting orders to foreign manufacturers that have assembly operations in China or source from China
- Stipulating that foreign suppliers enter into joint ventures with Chinese suppliers to COMAC
- Encouraging foreign countries to purchase aircraft produced by COMAC through diplomatic persuasion and the provision of loans.

Despite these measures, commercial aviation manufacturing still generates only a small fraction of China’s total industrial output (0.17 percent in 2010) compared to 3 percent of U.S. manufacturing output. China’s share of the world export market for aviation products was just 1.3 percent in 2011 compared to the United States’ 37 percent share of the global market and the European Union’s 44 percent.

One hurdle to convincing foreign companies of any kind to invest in China is the real and perceived lack of safeguards for intellectual property and technologies. The most common strategy employed by those that have been active in China for years is manufacturing key components outside China, which the joint venture then imports for final

China's government would be well advised to create a more equitable business environment for both foreign and Chinese manufacturers.

assembly. The fact that all materials and components used on aircraft must be certified by aviation regulatory agencies such as the Federal Aviation Administration (FAA) or the European Aviation Safety Agency (EASA) also helps to lessen the risk. Because Chinese manufacturers must obtain international certification for their components—even those used in Chinese aircraft—foreign companies that believe Chinese companies have violated intellectual property rights can attempt to prevent the certification (and hence the sale) of those products.

Aviation component manufacturers from outside of China have underlined the importance of innovation in preventing the emergence of Chinese competitors. This is especially true in the subcomponents industry, where the barrier posed by certification is not as high. To stay competitive, many companies now design some products specifically for China, and a number have been able to surpass their Chinese competitors even at the lower end of the market by focusing on quality, manufacturing efficiency, and distribution.

In our view, China's policies to promote commercial aviation manufacturing as a so-called national

champion have not yet borne fruit. Although output has grown rapidly, the shares of China's industry in world exports and gross industrial output have not markedly increased. The ARJ-21 is constructed largely, if not entirely, from foreign components, and the C919 will likely follow suit. Projected dates for the certification of the ARJ-21 have been postponed several times, and the C919 will definitely face delays. In short, China has yet to prove that it can produce commercially viable aircraft, much less show that it can become globally competitive.

How Should Western Countries Respond to China's Industrial Policies?

Both the United States and the European Union face a conundrum: China's leadership appears convinced of the efficacy of industrial policies in fostering new industries and expanding exports. In contrast, the United States and the European Union have moved away from using industrial policies to foster growth in specific industries because of cost, lack of efficacy, and an interest in creating a level playing field for international trade.

In both the United States and the European Union, the "squeaky wheel" rule reigns. Trade issues are placed on bilateral agendas or brought to the World Trade Organization (WTO) by a government only if a domestic company complains. Trade negotiators focus on industries where competition from Chinese firms threatens to have immediate consequences rather than on markets—such as commercial aviation manufacturing—that U.S. and European firms still dominate. In a world in which immediate

problems are given all the attention, what can and should the U.S. government and the EU do with regards to commercial aviation manufacturing specifically and China's industrial policy in general?

- Engage in bilateral negotiations with the EU to discourage the use of purchases of components as a marketing tool by Airbus and Boeing
- Push for more transparent tenders for aircraft purchases by Chinese state-owned airlines
- Ensure that Chinese aircraft components submitted for certification by the FAA or EASA do not incorporate intellectual property taken from other companies
- Work with domestic companies with operations in China to voluntarily report whether and how investment decisions have been influenced by Chinese industrial policies
- Continue to press the Chinese government in bilateral forums and at the WTO to dispense with industry-specific industrial policies
- Intervene promptly through the WTO and bilateral forums in response to efforts to use subsidies or other supports to enter foreign markets

Without a dramatic change in China's policy of supporting "national champions," none of these measures is likely to level the playing field in China for Western manufacturers. However, persistent efforts to reduce the trade-distorting effects of China's industrial policies through countervailing duties or other measures may mitigate some of the effects of China's policies.

What Should China Do?

China has aggressively pursued the development of a number of industries, including high-speed trains, wind turbines, and automobiles. In all three cases, the government has stipulated that to manufacture in China, foreign companies must enter into joint ventures with Chinese firms. In the case of wind turbines and high-speed trains, Chinese joint-venture partners developed their own products outside the joint venture and then captured the vast majority of sales in China. In both cases, state-owned companies have been the principal purchasers of the final product. However, deficiencies in the technologies of Chinese manufacturers have limited their ability to export. Because China has been the largest market in the world for high-speed trains and wind turbines, its industrial policy had an appreciable effect on the Chinese sales of foreign firms.

In the automotive sector, foreign manufacturers must also set up joint ventures with Chinese partners. In contrast to high-speed trains and wind turbines, joint-venture products continue to dominate the automotive market. In this industry, the principal purchasers are individuals or private companies; joint-venture manufacturers do not face a single, state-owned customer for their products.

China would benefit from carefully reviewing its policies of government support for commercial aviation manufacturing and making a considered decision whether this activity is a good use of China's resources. China is spending well over \$7 billion for the C919; the ARJ-21 has also been expensive, and the commercial success of both is doubtful. In light of the many hurdles facing

COMAC, this is an opportune time for the Chinese government to rethink its investments and policies targeting specific industries. Focusing its energies on creating a business-friendly environment for all firms—private, foreign, and state-owned alike—will be much more likely to result in a higher payoff.

One goal of China's leadership has been to put the country at the forefront of global advances in science and technology. China's talented engineers and scientists have registered significant advances in a large number of industries, including space and telecommunications. China also has successful multinational companies of its own. However, to the extent that foreign companies are not given the same treatment as their Chinese counterparts or fear their intellectual property rights will not be safe, they will remain cautious about what technologies they bring to China. China's government would be well advised to create a more equitable business environment for both foreign and Chinese manufacturers. The benefits for China would be considerable in terms of better allocation of investment, better integration into global technology supply chains, and the ability to put the substantial funds now employed in the support of national champions to better use.

Editor's Note: This essay was adapted from Keith Crane, Howard J. Shatz, Shanthi Nataraj, Steven W. Popper, and Xiao Wang, *An Outline of Strategies for Building an Innovation System for Knowledge City*, (RAND Corporation, 2012; available at www.rand.org/t/mg1240) and Keith Crane, Jill E. Luoto, Scott Warren Harold, David Yang, Samuel K. Berkowitz, Xiao Wang, *The Effectiveness of China's Industrial Policies in Commercial Aviation Manufacturing*, (RAND Corporation, 2014; available at www.rand.org/t/rr245).

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Night view of the crossings of elevated highways in Beijing. A massive new economic megalopolis—integrating more than 100 million people living in Beijing, Tianjin and the neighboring province of Hebei—will become an independent region influencing its own urban planning over the next five years, according to an official report released on June 23, 2015, and said to be a pet project of Xi Jinping.

Inset: A Chinese migrant worker carries luggage as he exits the Shaoxing Railway Station.



Making Cities More Livable Amid China's Great Migration

Liisa Ecola

China's cities are growing at an extraordinary pace. Each year, a population the size of Moscow shifts from rural to urban China, adding 16 million more people to the nation's already-crowded cities. Roughly half of China's 1.3 billion people now live in urban areas, and that percentage is ultimately expected to reach 70 percent—about the same as in developed countries.

While some of this urbanization is the result of formerly rural areas being re-designated as urban because of population growth—China has more than 160 cities with over 1 million residents—it is mostly the result of a large migration from less-affluent rural areas to medium and large cities.

With all of this migration in a relatively short period of time, China

is now challenged to improve the quality of life in cities that are poorly planned, choked with traffic, and suffer from poor air and water quality. The pace of growth is such that formal planning processes cannot keep up with demand for new development. Vehicle ownership per capita, while low compared with developed countries, is skyrocketing, and along with it, demands on road capacity. Air and water quality have been diminished in the rush to increase industrial production. Yet for many, the prospect of higher incomes and access to better services in cities far outweighs the disadvantages.

How can China continue its economic growth—with the resulting challenges from urbanization—while making tangible improvements in quality of life? RAND recently assessed how to both improve quality of life and measure those improvements in the nine Pearl River Delta

cities in China's Guangdong province. These cities have benefited enormously from the economic opportunities made possible from being the first of China's "special economic zones" in the late 1970s. However, breakneck growth has exacerbated many of their urban problems. To retain existing residents and attract new ones, the province is seeking a new growth model, one based on a transition to cleaner businesses that provide higher-paying jobs and a better quality of life.

While RAND's work is specific to Guangdong, many of the issues that the province is facing are common to cities across China. Our project assessed quality of life improvements in five areas:

Transportation

Land use

Environment

Housing

Economic development

The project team created an indicator system linked to defined policy goals to measure progress across all five areas. We did not set out to rank cities or to combine the indicators into an overall score; rather, each indicator is intended to measure current conditions accurately so that policy-makers can gauge progress toward goals to improve quality of life. We made specific suggestions regarding each area.

Transportation

As they become more affluent, many Chinese put a motor vehicle at the top of their wish list. With vehicle ownership rapidly increasing, demand for road space and parking far exceeds supply in most large cities. This contributes to illegal parking that in turn hampers the use of other modes

of transportation (it is not uncommon to find cars parked in bicycle or bus lanes). Meanwhile, the uptick in automobile use has come with a diminished use of public transit and bicycles, with predictable impacts on air quality and congestion.

To better manage parking demand and supply, China's metropolitan areas could charge more for parking and develop a smartphone application to make it easy to pay. The first tactic has reduced parking demand in other cities around the globe, and several cities are experimenting with the second, using technology both to manage how prices are set and to allow drivers to pay with their smartphones. Cities could measure progress by the extent to which drivers use the app.

Beyond steps to discourage cars in cities, China could also create incentives to use alternate forms of transport. To make public transit easier to use, cities could offer a stored-value fare card that can be used across buses, trains, and subways. Riders put money on the card, and the cost of each ride is drawn from the balance. This makes it easier for riders to transfer between systems, if needed, and the cards could be used for other purchases as well.

Land Use

Generally speaking, land use is difficult to incorporate into an indicator system. There is no correct "formula" for how much land should be devoted to specific uses or how high population density should be. But balanced and appropriate land use is important to goals such as reducing vehicle emissions or making it convenient to walk, bicycle, or ride public transit.

Chinese cities are currently confronted with haphazard land use, especially on the fringes of urban areas. This unplanned development ends up fragmenting both rural and urban land and makes it difficult for governments to provide public services efficiently. Even where planning processes exist, the speed of development often exceeds the ability of planners to keep pace. In addition, local governments depend heavily on revenue derived from developers because until recently, few local governments were allowed to levy property taxes; the conversion of rural land to urban developments has been their primary source of funding. Such conversions are particularly troubling in a country that has one of the lowest rates of arable farmland per capita in the world.

Given these challenges, increasing contiguity—that is, keeping rural lands rural and building new housing and offices near areas that are already developed—by creating and enforcing limits on the development of valuable agricultural land is a key policy goal for China's planners. This could be accomplished by designating urban growth boundaries (similar to the "ecological control lines" that already exist) and measured by the amount of agricultural land that remains undeveloped.

Environment

The pursuit of rapid economic growth, coupled with a lack of enforcement of environmental laws, has created major challenges for Chinese cities on three fronts: air quality, water quality, and soil contamination. Guangdong province has sufficient water, unlike northern and western China, but the quality is extremely poor. More than 20 percent of the river sites that are monitored in the



PUBLIC POLICIES CAN

Put the Brakes on Chinese Car Culture

China is the world's largest car producer—and its biggest market. As economic growth puts more money in Chinese wallets, will people adopt a U.S.-style car culture? Our research finds that unlikely.

While economic growth and rising incomes make car ownership more economically viable, income alone does not determine how much people drive in a given country. We found that numerous factors tend to increase driving, including

Pro-car policies, such as low vehicle taxes

Plentiful and good roads, and a lack of alternatives to driving

Inexpensive fuel and the existence of domestic oil

A large working-age population

Strength of the domestic car industry

The distribution and density of the urban population

Favorable car culture

Many—if not most—of these pro-car conditions exist in China, but we expect the prevalence of driving to grow only moderately compared to current rates in developed countries. We estimate that once the growth in automobile travel in China levels off, Chinese drivers will travel about 4,850 miles per capita per year, compared to 8,700 miles for American drivers. China

will likely trail fellow BRIC nations Russia and Brazil in driving growth and barely outpace India.

Why is the forecast so modest? Existing transportation policies in China's most populated areas tend to tamp down demand and moderate the effects of other factors. In some major cities, car use and ownership are restricted; no matter how many cars you can afford, for

example, license plates are available only by lottery.

A second RAND study focused on future mobility in China confirmed these trends. It found that the greater China's economic growth, the more drivers are likely to be on the road; however, restrictions on the purchase and use of vehicles could have a moderating effect.

Adapted from Liisa Ecola, Charlene Rohr, Johanna Zmud, Tobias Kuhnimhof, Peter Phleps, *The Future of Driving in Developing Countries* (RAND Corporation, 2014; available at www.rand.org/t/rr636).

province are so polluted they cannot be used to supply drinking water.

While environmental regulations in China have been strengthened over time, lax enforcement remains a problem. Fines imposed on violators are too small to change behavior, and a lack of transparency allows both corrupt regulators and violators to escape public notice. Beefing up enforcement and penalties is one strategy for reducing illegal discharges into rivers and groundwater. This could be measured in several ways: the number of trained inspectors per 100 facilities, the percent of facilities in full compliance with their permits, and the amount of fines collected annually.

Housing

Until the late 1970s, most Chinese lived in housing supplied by their work unit; the quality was often poor, but affordability was not an issue. Several waves of reform have created a housing market, but today it caters to more affluent buyers. Housing prices have soared in the past two decades, making affordable housing hard to find for lower- and middle-income households. In the Pearl River Delta cities, high-income individuals purchasing housing as an investment exacerbates the problem, especially because many of the units are not rented out.

An unusual feature of China's urbanization is the different treatment given to rural and urban lands. The state owns urban land (homeowners are essentially long-term leaseholders), while the original inhabitants of the local community collectively own rural lands. In rapidly urbanizing areas like Guangdong province, development springs up and surrounds enclaves of rural land,

creating so-called villages-in-cities. These villages are collectively owned by the inhabitants.

One way to increase the number of housing units is through "land readjustment," a policy aimed at redeveloping some of these villages-in-cities to both create more housing and bring existing dwellings up to modern standards. Under such a policy, an enclave's landowners agree to provide some portion of their land to create new infrastructure (generally roads and public spaces). In exchange, the government develops the infrastructure and returns to the landowners a smaller parcel of land, but one that is more valuable because of the surrounding improvements. This process acts as an incentive for the owners to develop or further improve their properties so they can collect higher rents made possible by the government's improvements.

Economic Development

Guangdong is one of China's most economically successful provinces, due largely to export-oriented manufacturing. However, moving "up the value chain"—that is, transitioning from low-wage assembly operations to higher-value activities that require workers with higher skills—presents a major challenge to the growth of industry. Such a shift would also help alleviate the large disparities in income within the province.

Without directly addressing business creation, one policy goal is ensuring that the workforce is capable of supporting these new businesses. This can be accomplished in two ways: Improving local quality of life to attract high-skilled workers, and developing new training programs to teach the existing workforce the skills these high-value

employers need. The success of both approaches can be measured with statistics such as the number of workers in key skill categories.

Conclusion

Once in place, trends in urbanization are difficult to change. None of these policies is easy to implement, and the outcomes may vary dramatically depending on the steps local governments take to improve quality of life. However, the continued migration to cities and increasing demands for higher-quality services provide a major incentive to dramatically enhance quality of life by improving how cities are planned, built, and managed.

Editor's Note: This essay was adapted from Debra Knopman, Johanna Zmud, Liisa Ecola, Zhimin Mao, Keith Crane, *Quality of Life Indicators and Policy Strategies to Advance Sustainability in the Pearl River Delta* (RAND Corporation, forthcoming 2015).

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Chinese tourists make their way on an algae-covered beach in Qingdao city, east China's Shandong province, July 19, 2015. Huge algae blooms have taken over the beaches here every summer for the past eight years.



The Olympic Park Observation Tower, shown here under construction, was completed and opened in 2014

Concluding Thoughts

Michael Rich

Taken together, these essays articulate a compelling and complicated story about the People's Republic of China. With its deep experience and expertise in the region, RAND is uniquely positioned to help policymakers piece together the puzzle that is China.

Economically, China is a powerhouse that recently overtook the United States as the world's largest economy in terms of purchasing power parity, but China's focus is shifting from acting as the world's manufacturer to developing its own consumer class. Militarily, China has an enormous force—but its troops are poorly educated and China's leadership has military ambitions that dwarf its actual capabilities. Politically, the People's Republic is focused inward to a great extent as it attempts to meet the demands of a population that grows more sophisticated and demanding by the day.

The topics covered in this collection also point to how complex U.S.-Sino relations really are. China is neither friend nor foe. While the sheer size of China's population and land mass make it a potential threat to U.S. interests, China is perhaps focused so much on its own inner workings that its threat to the United States is more appearance than actuality.

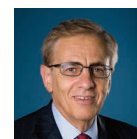
Nevertheless, what happens next in that country will have a profound impact on the region, the United States, and the rest of the world. It is crucial for the U.S. decisionmakers who are responsible for China policymaking to have objective, nonpartisan, data-driven research informing their decisions.

RAND researchers have conducted thought-provoking research related to the country's military, political, and trade relations, especially with Taiwan and Japan; its environmental, economic, and health policies; and its international business and intellectual

property challenges. As CEO of RAND, I am extremely proud of this prominent body of work.

The challenges involved are highly complex and stretch across virtually every policy domain. With our significant experience working across the issues relevant to U.S. China policy, our deep bench of experts on the region and its most-pressing topics, and our demonstrated proficiency in policy research, RAND will continue to connect the dots.

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The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.





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EDUCATION AND THE ARTS
ENERGY AND ENVIRONMENT
HEALTH AND HEALTH CARE
INFRASTRUCTURE AND
TRANSPORTATION
INTERNATIONAL AFFAIRS
LAW AND BUSINESS
NATIONAL SECURITY
POPULATION AND AGING
PUBLIC SAFETY
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